APPENDIX I

Essential Fish Habitat Assessment

DRAFT
ESSENTIAL FISH HABITAT ASSESSMENT

ISLANDER EAST PIPELINE PROJECT

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ACRONYMS AND ABBREVIATIONS

°C	degree Celsius
Algonquin	Algonquin Gas Transmission Company
CFR	Code of Federal Regulations
cm	centimeter
cm/s	centimeter per second
CTDEP	Connecticut Department of Environmental Protection
DO	dissolved oxygen
Drill Plan	directional drill contingency plan
ECL	Environmental Conservation Law
EFH	Essential Fish Habitat
FERC	Federal Energy Regulatory Commission
HDD	horizontal directional drill
Islander East	Islander East Pipeline Company, L.L.C.
lb/in^2	pounds per square inch
m	meter
MAB	mid-Atlantic Bight
MBC	marine benthic communities
mg/l	milligram per liter
mm	millimeter
MP	milepost
MAFMC	Mid-Atlantic Fishery Management Council
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended through 1998
NEFMC	New England Fishery Management Council
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NYSDEC	New York State Department of Environmental Conservation
ppm	parts per million
ppt	parts per thousand
ROW	right-of-way
SAFMC	South Atlantic Fishery Management Council
SNE	southern New England
SPCC Plan	Spill Prevention Containment and Countermeasures Plan
TL	total length
USDOC	United States Department of Commerce
USDOT	United States Department of Transportation
YOY	young-of-year

1.0 INTRODUCTION

The purpose of this document is to present the findings of the Essential Fish Habitat (EFH) Assessment conducted for the proposed Islander East Pipeline Project as required by the Magnuson-Stevens Fishery Conservation and Management Act of 1976, as amended through 1998 (MSFCMA). This EFH Assessment is based on the regulations implemented in the United States Department of Commerce (USDOC), National Oceanic and Atmospheric Administration (NOAA) EFH Final Rule, 50 Code of Federal Regulations (CFR) Part 600 (**Federal Register 2002**). The objective of this EFH Assessment is to describe how the actions proposed as part of the Islander East Pipeline Project may affect EFH-designated species by the National Marine Fisheries Service (NMFS) for the area of influence of the project. According to the NMFS, EFH within the Long Island Sound includes those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The area of influence of the project would be from the Town of Branford, Connecticut to the Town of Brookhaven, New York.

The contents of this report meet the requirements described by the NMFS to comply with the MSFCMA. The EFH Assessment includes a description of the proposed action; an analysis of the direct and cumulative effects on EFH for the managed fish species and their major food sources; our views regarding the effects of the proposed action; and proposed mitigation measures selected to minimize expected project effects if applicable.

2.0 PROJECT DESCRIPTION

The Islander East Pipeline Project (Project) would involve actions by two separate pipeline companies: Algonquin Gas Transmission Company (Algonquin) and Islander East Pipeline Company, L.L.C. (Islander East). Algonquin proposes to construct a new compressor station and upgrade existing interstate natural gas pipeline facilities in Connecticut, and Islander East proposes to lease pipeline capacity on facilities owned by Algonquin and construct new interstate natural gas pipeline facilities in Connecticut and New York (see Figure 2-1).

Algonquin would retest and upgrade its existing C-1 (10 inches in diameter) and C-1 L (16 inches in diameter) system pipelines in New Haven County, Connecticut from current maximum allowable operation pressure of 750 pounds per square inch (lb/in^2) to a new maximum allowable operating pressure of 814 lb/in^2. The pipelines parallel each other and each are approximately 13.7 miles long. In total, 27.4 miles of pipeline would be retested and upgraded. Algonquin would also expose, inspect, and repair, as necessary, two 25-foot-long segments of its C-1 pipeline [near milepost (MP) 3.8] in New Haven County, Connecticut.

Algonquin would construct a new 12,028 horsepower compressor station in Cheshire, Connecticut. The compressor station would be installed at the beginning of the C-1 and C-1 L pipelines (near MP 0.1) and include aboveground piping, launchers, buildings, fencing, and pavement. Algonquin would remove two launchers from an existing mainline valve and interconnect facility at MP 0.6 in New Haven County, Connecticut, and relocate the launchers to the proposed Cheshire Compressor Station.

Islander East would construct approximately 44.8 miles of new 24-inch-diameter pipeline from the terminus of the existing Algonquin C-1 and C-1 L pipelines in North Haven, Connecticut, through the towns of North Haven, East Haven, North Branford, and Branford, Connecticut, across Long Island Sound, through the town of Brookhaven, New York, to a planned power plant in Brookhaven. The new pipeline would be designed with a maximum allowable operating pressure of 900 lb/in^2.

Islander East would construct a new interconnect meter station and 24-inch-diameter launcher at the beginning of the Islander East Pipeline (MP 0.0 on the Islander East Pipeline) in North Haven, Connecticut. The meter station would be located within or adjacent to Algonquin's existing North Haven Meter Station and serve as a custody transfer point for gas from the existing Algonquin C-1 and C-1 L pipelines to the Islander East Pipeline.

Islander East would construct a new meter station and 24-inch-diameter receiver at the terminus of the Islander East Pipeline (MP 44.8 on the Islander East Pipeline) in Brookhaven, New York. This facility would contain two separate meters and would serve as a delivery point for gas from the Islander East Pipeline to an existing KeySpan Energy Delivery Long Island distribution pipeline and to a planned Brookhaven Energy Limited Partnership power plant.

Islander East would construct 5.6 miles of 24-inch diameter pipeline to reach a new meter station and 24-inch-diameter receiver at the terminus of the Calverton Lateral (MP CA 5.6 on the Calverton Lateral) in Calverton, New York. This meter station would serve as a delivery point for gas from the Calverton Lateral to a planned AES Long Island power plant.

Islander East would construct five new aboveground valves at intervals along the pipeline depending on population density and in accordance with the United States Department of Transportation (USDOT) regulations. The valves would be located at MPs 6.0, 9.9, 33.2, 34.3, and 42.0 on the Islander East Pipeline. The mainline valve site at MP 33.2 would contain a side tap valve for a possible future connection to potential customers. The mainline valve site at MP 34.3 would contain a 24-inch-diameter side tap valve and a 24-inch-diameter launcher for the Calverton Lateral.

The pipeline facilities proposed by Algonquin and Islander East are summarized in Table 2-1.

TABLE 2-1
Pipeline Facilities

Facility Name	Description	Diameter (inches)	Length (miles)	County, State
ALGONQUIN				
Algonquin Pipelines Retest	Upgrade C-1 and C-1 L Lines	10 and 16	27.4 (13.7 Each Line)	New Haven County, CT
Anomaly Investigations	Inspect C-1 Line	10	< 0.1	New Haven County, CT
ISLANDER EAST				
Islander East Pipeline	New Mainline	24	44.8 { 21.2[a]	New Haven County, CT
			23.6[b]	Suffolk County, NY
Calverton Lateral	New Lateral	24	5.6	Suffolk County, NY

[a] Includes 10.2 miles onshore and 11.0 miles offshore in Long Island Sound.
[b] Includes 12.0 miles onshore and 11.6 miles offshore in Long Island Sound.

Algonquin proposes to use between 25 and 110 feet of construction right-of-way (ROW) to conduct the Algonquin Pipelines Retest and the Anomaly Investigations. In general, Islander East proposes to use a 75-foot-wide construction ROW to construct its pipeline. In most areas, the construction ROW would comprise a 25-foot-wide area to be used for temporary storage of ditch spoil and a 50-foot-wide area (where a majority of the work would take place) to operate equipment and assemble the pipeline.

Long Island Sound is bounded by Connecticut on the north and by Long Island, New York on the south. The waterbody is approximately 113 miles long (east to west) and approximately 20 miles across (north to south) at its widest point. Mid-Sound depths vary between 60 and 130 feet. The Islander East Pipeline traverses the central portion of the Long Island Sound for 22.6 miles between MPs 10.2 and 32.8 (Table 2-1). This includes 11.0 miles in Connecticut waters and 11.6 miles in New York waters. The pipeline would be installed at an offshore depth of 0 to 12 feet from MPs 10.2 to 10.9 along the Connecticut shoreline and from MPs 32.7 to 32.8 along the New York shoreline. The pipeline would be installed at offshore depths of 12 feet to a maximum of 130 feet (at approximately MP 26.0) from MPs 10.9 to 32.7.

Islander East would use the horizontal directional drill (HDD) technique to install an approximately 4,000-foot-long segment of the pipeline at the mainland approach to Connecticut (MPs 10.1 to 10.9). The process would involve drilling a hole from a point on the mainland (entry side) to a point on the seafloor (exit side) and installing a prefabricated segment of pipe through the hole. The HDD exit hole would emerge at a depth of approximately 12.5 feet. Where HDD would be conducted (*i.e.,* under the Connecticut nearshore waters of the Long Island Sound), the primary work area is defined as being between 60 feet (for the onshore to offshore drill) and 80 feet wide (for the offshore conventional pipe lay). Ideally, HDD would involve no disturbance to the seafloor over the length of the drilled section, and the work area would not be disturbed.

The portion of the pipeline between MPs 10.9 and 32.0 would be installed by using the jetting or subsea plow construction methods. Where the pipeline is installed using typical offshore construction techniques (*i.e.,* in water deeper than 10 feet), the primary work area for laying and burying the pipe on the seafloor would be approximately 80 feet wide, roughly centered over the pipe. If a floatation channel for construction vessels is needed (*i.e.,* in water 10 feet deep or less at the Long Island approach), the primary work area would be approximately 150 feet wide, roughly centered over the pipe.

Finally, Islander East would use the dredge construction technique in shallow waters (less than 25 feet deep) on the approach to the Long Island mainland between MPs 32.0 and 32.8. The dredging technique would require excavation using a crane or hydraulic excavator positioned on a relatively small barge instead of using a subsea jetting sled or plow.

The crossing of Long Island Sound would require deepwater construction techniques to install the pipeline. Deepwater construction typically uses two barges working in tandem to install the pipeline: the lay barge and the bury barge. The pipeline is welded together on the lay barge, then set on the seafloor. The lay barge is followed by the bury barge, which excavates a trench under the pipeline and, at least partially, buries the line to complete the installation. Alternatively, the lay barge may be used to perform both functions, first welding and laying the pipe and then returning along the pipeline to bury it.

The Long Island Sound mainline would be assembled and lowered onto the seafloor from a slow moving lay barge where an assembly line of welding, coating, and inspection stations would be set up on the lay barge deck. Lay barges are typically moored in place and propelled by winches attached by cable to an array of large anchors. The lay barges that would be used on the Islander East

Pipeline Project may have between 8 and 12 anchors, each approximately 10 feet wide. The anchors are designed to penetrate several feet into seafloor sediments to gain hold when the cables are tensioned. The maximum extent of the mooring anchor array would be approximately 2,500 feet to the front and back of the barge, and approximately 2,000 feet to either side. As the lay barge advances, tugboats lift the anchors from the seafloor and reposition them at half-mile intervals in the direction of movement.

In general, the pipeline would be concrete coated and buried a minimum of three feet below the seafloor in 12 feet of water or less. In areas over 12 feet of water, the pipeline would be concrete-coated and buried to at least one-half its diameter, or deeper as determined after consultation with state permitting agencies. Where the pipeline crosses foreign utilities or submerged bedrock outcrops, the pipeline may be laid on the surface of the seafloor and armored with stone rip-rap or concrete mats. The bury barge would be equipped with a subsea jetting sled. The jetting sled would be positioned over the pipeline on the seafloor and would be moved via the anchored bury barge. The jetting sled uses high-pressure water to rapidly remove the seafloor under the pipeline, which settles into the trench created by the jetting action. To achieve the required burial depth, multiple passes of the jetting sled may be required. Backfilling of the trench would be accomplished by settling of the trench walls and natural sedimentation.

An alternative to the jetting sled would be the subsea plow. Like the jetting sled, the subsea plow would be positioned over the pipeline and would ride along the seafloor on pontoons. However, unlike the jetting sled, the subsea plow physically cuts the seafloor and casts excavated spoil on the side of the trench. The subsea plow may be preferred in areas where immediate backfilling of the trench is required or where low water turbidity is necessary.

The MSFCMA set forth several new mandates for the USDOC, NOAA, NMFS, New England Fishery Management Council (NEFMC), Mid-Atlantic Fishery Management Council (MAFMC), South Atlantic Fishery Management Council (SAFMC), and other federal agencies to identify and protect important marine and anadromous fish habitat. Although the concept of EFH is similar to "critical habitat" under the Endangered Species Act of 1973, measures recommended to protect EFH are advisory, rather than prescriptive.

The councils, with assistance from NMFS, are required to delineate "essential fish habitat" for all managed species. EFH is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." The regulations further clarify EFH by defining "waters" to include aquatic areas that are used by fish (either currently or historically) and their associated physical, chemical, and biological properties; "substrate" to include sediment, hard bottom, and structures underlying the water; and, areas used for "spawning, breeding, feeding, and growth to maturity" to cover a species' full life cycle. Prey species are defined as being a food source for one or more designated fish species, and the presence of adequate prey is one of the biological properties that can make a habitat essential.

EFH-designated species and life history stages in the Islander East Pipeline Project area were identified based on a list in the NOAA's *Guide to EFH Designations in the Northeastern United States* (USDOC 1999a). The guide lists EFH-designated species in selected 10-minute by 10-minute squares of latitude and longitude along the coast and provides a geographic species of EFH designations completed by the NEFMC, MAFMC, SAFMC, and the NMFS in the Northeastern United States pursuant to the MSFCMA (Table 3-1).

TABLE 3-1
Ten Minute Square Coordinate Designations
Along the Islander East Pipeline Project in Long Island Sound

	North	East	South	West
Connecticut Coastline	41°20' N	72°40' W	41°10' N	72°50' W
Long Island Sound	41°10' N	72°40' W	41°00' N	72°50' W
Long Island Sound	41°10' N	72°50' W	41°00' N	73°00' W
Long Island Coastline	41°00' N	72°50' W	40°50' N	73°00' W

Source: USDOC 1999a.

A total of 16 finfish and three shark species are currently designated as EFH species along the proposed route of the Islander East Pipeline Project in state and Federal waters. Table 4-1 lists these species and their life-stage designations.

TABLE 4-1
Summary of Essential Fish Habitat Designation (All Four Ten Minute Squares)

Fish Species	Eggs	Larvae	Juveniles	Adults
Atlantic mackerel (*Scomber scombrus*)	X	X	X	X
Atlantic salmon (*Salmo salar*)			X	X
Atlantic sea herring (*Clupea harengus*)			X	X
American plaice (*Hippoglossoides platessoides*)			X	X
black sea bass (*Centropristus striata*)			X	
bluefish (*Pomatomus saltatrix*)			X	X
cobia (*Rachycentron canadum*)	X	X	X	X
king mackerel (*Scomberomorus cavalla*)	X	X	X	X
pollock (*Pollachius virens*)			X	X
red hake (*Urophycis chuss*)	X	X	X	X
scup (*Stenotomus chrysops*)	X	X	X	X
Spanish mackerel (*Scomberomorus maculatus*)	X	X	X	X
summer flounder (*paralicthys dentatus*)			X	
whiting (*Merluccius bilinearis*)				X
windowpane (*Scopthalmus aquosus*)	X	X	X	X
winter flounder (*Pseudopleuronectes americanus*)	X	X	X	X
Shark Species	**Eggs**	**Larvae**	**Juveniles**	**Adults**
blue shark (*Prionace glauca*)				X
sandbar shark (*Charcharinus plumbeus*)		X		X
sand tiger shark (*Odontaspis taurus*)		X		
Source: USDOC 1999a.				

4.1 ECOLOGICAL NOTES ON THE EFH FISHERIES AND SPECIES

Available information on the life history and habitat requirements for each EFH designated species is summarized in this section. For most species, the primary source was one of a series of EFH source documents prepared by the NMFS in 1999 and cited once at the beginning of each species summary. Several other primary sources are also identified. Conclusions regarding the likelihood of occurrence of each species and life history stage along the Islander East Pipeline Project route are presented at the end of each species assessment. In reaching these conclusions, emphasis was given to the depth and water quality preferences of eggs, larvae, juveniles, and adults, and their association with bottom substrates. Information on depth and substrate preferences is important because the Long Island Sound varies in depth and the predominant bottom substrate along the pipeline route consists of fine-grained deposition. Another important factor is whether the bottom sediments along the pipeline route provide suitable habitat for invertebrates that are preyed upon by the bottom feeding EFH species.

4.1.1 Coastal Demersal Fishery

American Plaice: Juveniles and Adults

Primary source: Johnson *et al.* (1999)

Juvenile and adult American plaice have similar habitat preferences. Both can be found in inshore and shoal areas over fine-grained sediments or sand or gravel bottom habitats, and largely use the open ocean as a nursery. Juveniles prefer water temperature < 17 degree Celsius (°C), salinity around 33 parts per thousand (ppt), and depths from 45 to 150 meters (m). Adults prefer water temperatures < 17°C, salinity between 20 to 34 ppt, and depths from 45 to 175 m.

Project area: The American plaice is an arctic-boreal pleuronectid flatfish with the Project area being the southern temperature limit for this species, therefore an occasional juvenile and adult may occupy the Project area during the spring and fall.

Pollock: Juveniles and Adults

Primary source: Cargnelli *et al.* (1999)

Juvenile pollock have been know to migrate inshore to inhabit subtidal and intertidal zones that serve as important nursery areas. Juveniles have been reported over sand, mud, rocky bottom, and aquatic vegetation. Juveniles undergo a series of inshore-offshore movements linked to temperature until near the end of their second year. They then move offshore where they remain throughout the adult stage. Juveniles are commonly caught inshore during bottom trawl surveys in summer and fall in the Gulf of Maine and on Georges Bank, but only a few are found south of Cape Cod. Juveniles in the northwest Atlantic prefer temperatures of 0 to 15.6°C and salinities of 29 to 32 ppt. Adult pollock have a temperature preference of 6 to 10°C and salinities ranging from 33 to 34 ppt.

Project area: The pollock is a gadoid species commonly found in colder water of the northern Atlantic Ocean (*i.e.*, Scotian Shelf, Georges Bank, and the Gulf of Maine), but are known to occur as far south as North Carolina. Based on the habitat utilization of this species, juvenile and adult pollock may occupy the Project area during the spring, but in low numbers.

Red Hake: All Stages

Primary source: Steimle *et al.* (1999b)

Red hake spawn offshore in the mid-Atlantic Bight (MAB) in the summer, primarily in southern New England (SNE). The distribution of eggs is unknown because they cannot be distinguished from other hakes. Larvae dominate the summer ichthyoplankton in the MAB and are most abundant on the mid- and outer-continental shelf. Red hake larvae prefer temperatures of 8 to 23°C and depths < 200 m. Larvae typically settle to the bottom in the fall and need shelter (including live sea scallop). Juveniles seek shelter and commonly associate with scallops, surf clam shells, and seabed depressions. Juveniles prefer depths from < 120 m to the low tide line and temperatures between 2 to 22°C. Adults prefer depths from 30 to 130 m and temperatures between 2 to 22°C. Adults are typically associated with sand-mud bottom in holes and depressions. Both juveniles and adults make seasonal migrations in response to changes in water temperatures.

Project area: Based on the habitat utilization of this species, hake eggs (including eggs of other species besides red hake) would be found in the water column of the Project area, but red hake larvae are less likely to occupy shallow coastal waters. Juvenile and adult red hake are attracted to deeper, cooler water, but can be expected to occupy the Project area in all seasons.

Summer Flounder: Juveniles

Primary source: Packer *et al.* (1999)

Summer flounder exhibit strong inshore-offshore movements. Juveniles are distributed inshore and occupy many estuaries during spring, summer, and fall. Some juveniles remain inshore for an entire year before migrating offshore, while others move offshore in the fall and return the following spring. Juvenile summer flounder utilize several different estuarine habitats such as marsh creeks, seagrass beds, mud flats, and open bay areas. As long as other conditions are favorable, substrate preferences and prey availability are the most important factors affecting distribution. Some studies indicate that juveniles prefer mixed or sandy substrates, and others show that mud and vegetated habitats are used. Juvenile summer flounder prefer depths < 5 m (in estuary), salinities between 10 to 30 ppt, and temperatures > 11°C.

Project area: Given their association with sandy substrates and the fact that they feed on a variety of bottom-dwelling invertebrates and fish species, juvenile summer flounder are expected to occupy the Project area from spring to fall.

Whiting: Adults

Primary source: Morse *et al.* (1999)

Whiting, or silver hake, spawn on the outer-continental shelf. Eggs and larvae are distributed in mid- and outer-shelf waters, but not in coastal waters. Significant egg production occurs during May to October, with a peak in August. Primary spawning grounds apparently occur between Cape Cod and Montauk Point, New York, on the southeastern slope of Georges Bank, and in Massachusetts Bay. Adults occupy bottom habitats of all substrate types. In general, adults occur in a range of depths between 5 to 500 m and temperatures between 3 to 22°C.

Project area: Based on the habitat utilization of this species, adult whiting can be expected to occupy the Project area in all seasons.

Windowpane: All Stages

Primary source: Chang *et al.* (1999)

Windowpane is a shallow water mid- and inner-shelf species found primarily between Georges Bank and Cape Hatteras on fine sandy sediment. Spawning occurs on inner shelf waters, including many coastal bays and sounds, and on Georges Bank. Eggs and larvae are found in the water column at depths < 70 m and temperatures < 20°C. Juveniles and adults are similarly distributed and prefer bottom habitats with substrate of mud or fine grained sand. They are found in most bays and estuaries south of Cape Cod throughout the year at depths from 1 to 100 m, temperatures < 27°C, and salinities between 5.5 to 36 ppt. Juveniles that settle in shallow inshore waters move to deeper offshore waters as they grow. Adults occur primarily on sand substrates off SNE and MAB.

Project area: Juvenile and adult windowpane are commonly found on shallow, sandy substrates and are expected to occupy the Project area in all seasons. Because this species spawns in inner shelf and nearshore waters, eggs and larvae are expected be found in the Project area in all seasons except during the winter.

Winter Flounder: All Stages

Primary source: Pereira *et al.* (1999)

Winter flounder spawning occurs from late winter through early spring, peaking south of Cape Cod in February and March. Spawning is initiated when the water temperature is about 3°C. Eggs are found inshore in depths < 4.5 m, with salinities between 10 to 32 ppt and dissolved oxygen (DO) between 11.1 to 14.2 milligram per liter (mg/l). Eggs are adhesive and demersal and are deposited on a variety of substrates. Sand is the most common, however, they have been found attached to vegetation and on mud and gravel. Larvae are found inshore in depths < 4.5 m over fine sand and gravel substrates. Larvae are most abundant at temperatures between 2 to 15°C, salinities between 3.2 to 30 ppt, and DO between 10 to 16.1 mg/l.

Habitat utilization by young-of-year (YOY) is not consistent across habitat types and is highly variable among systems and from year to year, and have been associated with *Ulva*, eelgrass, and unvegetated adjacent areas. YOY juveniles are typically found inshore in depths < 12 m over mud to sand substrate with shell or leaf litter, with temperatures < 29.4°C and salinities between 23 to 33 ppt. Juveniles in Long Island Sound can be found at depths between 18 to 27 m, with water temperatures between 10 to 25°C and salinities between 19 to 21 ppt. Adult winter flounder prefer temperatures of 12 to 15°C, DO > 2.9 mg/l, and salinities > 22 ppt. Adults are found inshore at depths < 30 m over mud, sand, cobble, rocks, and boulders.

Project area: Winter flounder deposit eggs on sandy continental shelf substrates in depths as great as 120 m. The sandy habitat of the Project area may provide suitable spawning habitat for this species during the winter. In addition, winter flounder would also spawn on the neighboring shoal areas. Due to the strong correlation of spawning beds and nursery grounds, winter flounder larvae are expected to be found in the Project area during the spring and summer. Juveniles and adults can be expected to be common in the Project area in all seasons.

4.1.2 Coastal Pelagic Fishery

Atlantic Mackerel: All Stages

Primary source: Studholme *et al.* (1999)

Atlantic mackerel overwinter in deep water on the continental shelf from Sable Island Bank (Canada) to Chesapeake Bay and in spring move inshore and northeast. This pattern is reversed in the fall. In spring, adults form two spawning aggregations; the southern group spawns off New Jersey and New York and in the Gulf of Maine from mid April to June. Most spawning occurs in the shoreward half of the continental shelf. Spawning occurs when water temperatures are ≥ 7°C and peaks with salinities > 30 ppt. Eggs are pelagic, and found at depths ranging from 10 to 325 m. Eggs are typically collected at temperatures between 5 to 23°C in estuarine (18 to 25 ppt) to full (> 30 ppt) seawater.

Larvae are most abundant in offshore waters where salinities are > 30 ppt. The distribution of larvae is from 10 to 130 m, with preferences < 50 m, and at temperatures between 6 to 22°C. Juveniles are found in inshore bays and estuaries, as well as offshore where salinities are > 25 ppt and temperatures range from 4 to 22°C. Depth preference of juveniles varies with the season and ranges from 0 to 320 m, with a trend of moving into deeper waters as water temperature cools. Similar with the juveniles, depth preference of adults changes seasonally (10 to 340 m), possibly influenced by prey availability. Adults prefer salinities > 25 ppt and are intolerant of temperatures below 5 to 6°C or above 15 to 16°C.

Project area: Based on the habitat utilization of this species, juvenile and adult Atlantic mackerel are common from the spring to the fall and eggs and larvae are common from late spring to early summer.

Atlantic Salmon: Juveniles and Adults

Primary Source: NEFMC (1999)

Juvenile Atlantic salmon in rivers prefer bottom habitats with shallow gravel/cobble riffles interspersed with deeper riffles and pools. Salmon parr are found in clean, well-oxygenated fresh water in depths between 10 to 61 centimeter (cm) with temperatures < 25°C and water velocities between 30 to 92 cm per second (cm/s). Salmon parr grow and transform into smolts, and require access to the ocean to grow into adults. Adult salmon are primarily pelagic and range from the waters of the continental shelf off SNE north throughout the Gulf of Maine. Once at sea, salmon travel to distant feeding grounds and return to their natal stream to spawn in the fall. Spawning salmon are found to migrate to spawning grounds when water temperatures are < 22.8°C and DO levels are > 5 parts per million (ppm). Spawning beds (redd) are typically found in bottom habitats with gravel or cobble riffle above or below a pool in rivers with water temperatures < 10°C, depths between 30 to 61 cm, and water velocities around 61 cm/s.

Project area: Based on the habitat utilization of this species, juvenile and adult Atlantic salmon may occupy the Project area during the spring and fall, but in limited numbers.

Atlantic Sea Herring: Juveniles and Adults

Primary Source: Reid *et al.* (1999)

Adult Atlantic sea herring migrate south into SNE and mid-Atlantic shelf waters in the winter after spawning in the Gulf of Maine, on Georges Bank, and Nantucket Shoals. Juveniles and adult herring are abundant in coastal and mid-shelf waters from SNE to Cape Hatteras in the winter and spring. In the spring, adults return north, but juveniles do not undertake coastal migrations. Larvae typically metamorphose the following spring into YOY juveniles. Larval herring are limited almost exclusively to Georges Bank and the Gulf of Maine waters and have a preference for higher salinities with increasing age. Adult herring in the Long Island Sound have a springtime preference of temperatures between 9 to 10°C, depths of 10 to 30 m, and salinities of 25 to 28 ppt, and a fall preference of temperatures between 17 to 21°C, depths at 10 to 18 m, and salinities of 27 to 28 ppt. Adults spawn on stable materials (*i.e.,* small stones and gravel) in temperatures between 7 to 15°C and prefer salinities > 28 ppt.

Project area: Based on the habitat utilization of this species, juvenile Atlantic herring are likely to occupy the Project area during the spring and early fall, and adults are likely to occupy the Project area during winter and spring.

Bluefish: Juveniles and Adults

Primary source: Fahay *et al.* (1999)

Juveniles move inshore in early- to mid-June, arriving when temperatures reach approximately 20°C. They typically are found near shorelines, including the surf zone, during the day and in open waters at night. Like adults, they are active swimmers and feed on small forage fishes, which are commonly found in nearshore habitats. They remain inshore in water temperatures up to 30°C and return to the continental shelf in the fall when water temperatures reach approximately 15°C. Juvenile bluefish are associated mostly with sand, but are also found over silt and clay bottom substrates. They usually occur at salinities of 23 to 33 ppt, but can tolerate salinities as low as 3 ppt. Adults are generally oceanic but are found nearshore as well as offshore. Adults usually prefer warm water (at least 14 to 16°C) and full salinity. Both YOY juveniles and adults appear in the Long Island Sound during May/June and are found in depths < 18 m.

> ***Project area:*** Based on the habitat utilization of this species, YOY juvenile bluefish can be expected to occupy the Project area during the summer. Adults are typically pelagic and are expected to occupy the Project area during the summer.

Black Sea Bass: Juveniles

> ***Primary source:*** Steimle *et al.* (1999a)

Black sea bass are usually strongly associated with structured, sheltering habitats such as reefs and wrecks. When larvae reach 10 to 16 millimeters (mm) total length (TL), they tend to settle and become demersal on structured inshore habitats, such as sponge and eelgrass beds. The estuarine nursery habitat of YOY black sea bass is a relatively shallow, hard bottom with some kind of natural or man-made structure, with amphipod tubes, eelgrass, sponges, and shellfish beds, and salinities above 8 ppt. Black sea bass do not tolerate cold inshore winter conditions. Following an overwintering period presumably spent on the continental shelf, older juveniles return to inshore estuaries in late spring and early summer. They are uncommon in open, unvegetated, sandy intertidal flats or beaches. Juveniles in the Long Island Sound prefer temperatures of 14 to 19°C, depths of 5 to 50 m, and salinities of 23 to 32 ppt.

> ***Project area:*** Based on the habitat utilization of this species and the proximity of structure along the proposed pipeline route, juvenile black sea bass are expected to occupy the Project area during spring and early summer.

Cobia: All Stages

> ***Primary source:*** Richards (1967), National Audubon Society (1983)

Cobia is a southern species that overwinters near the Florida Keys and migrates in the spring and summer to the mid-Atlantic states to spawn. Adults are rarely found as far north as Massachusetts. Cobia can be found in all coastal inlets and prefer water temperatures > 20°C and salinities > 30 ppt. Cobia can be found over sandy shoals of capes and offshore bars, and high profile rock bottoms and oceanside barrier islands from surf zone to the continental shelf. In general, cobia prefer high salinity bays, estuaries, and seagrass habitats.

> ***Project area:*** Cobia is a pelagic, warm water species. The Project area is the northern temperature limit for this species, therefore an occasional adult cobia may occur in the water column of the Project area during the summer, but other life history stages of this species are not likely to be found at the Project area.

King and Spanish Mackerel: All Stages

Primary source: Godcharles and Murphy (1986), Collette and Nauen (1983)

King and Spanish mackerels are highly migratory epipelagic, neritic fish that migrate north from Florida as far as the Gulf of Maine in the summer and fall. King mackerel spawn in coastal waters of the Gulf of Mexico and off the South Atlantic coast. Thus, only a few adults of this species would be expected to inhabit Long Island Sound. In contrast, Spanish mackerel spawn as far north as Sandy Hook and Long Island in late August to late September.

> ***Project area:*** Due to the migratory and epipelagic nature of the Spanish and king mackerels, a few adult Spanish and king mackerels may pass through the Project area to feed during their annual northward migration and when they return south in the fall. Consequently, early life stages of these species would be rare in the Project area.

Scup: All Stages

Primary source: Steimle *et al.* (1999c)

Scup spawn along the inner continental shelf from Delaware Bay to SNE between May and August, primarily in bays and sounds in and near SNE. Spawning typically occurs in waters < 30 m deep, temperatures between 11 to 23°C, and salinities > 15 ppt. Larvae are also common in nearshore waters of MAB and SNE. Larvae will remain in the water column (< 20 m) until juvenile transition and prefer temperatures between 14 to 22°C and salinities > 15 ppt. Juvenile scup appear to use a variety of coastal intertidal and subtidal sedimentary habitats during their seasonal inshore residency, including sand, mud, mussel beds, and eelgrass beds. In the Long Island Sound, juvenile scup were collected at bottom temperatures between 7 to 22°C and salinities of 25 to 31 ppt. Adults move inshore during early May and June between Long Island and Delaware Bay. Adults are found inside bays and sounds, but like juveniles, do not penetrate low salinity areas. Adults are often observed or caught over soft, sandy bottoms and in or near structured habitats, such as rocky ledges, wrecks, artificial reefs, and mussel beds. Adults move offshore once water temperatures fall below 7.5 to 10°C in the fall.

> ***Project area:*** Juvenile and adult scup are known to occupy sandy bottom areas, but are likely to occur on the shallower sandy shoal areas of Long Island Sound. Based on the habitat utilization of this species, juvenile and adult scup are expected to occupy the Project area during the spring and summer months.

4.1.3 Highly Migratory Species

Blue Shark: Adults

Primary source: Compagno (1984)

The blue shark is a wide-ranging species found primarily in open, oceanic waters, but also occasionally inshore. Blue shark is a pelagic species that inhabits clear, deep, blue waters, usually in temperatures of 10 to 20°C, and depths > 180 m. In temperate waters, they often venture to the edges of kelp forests and are sometimes caught in pound nets. Tagged blue sharks in the North Atlantic showed a regular clockwise trans-Atlantic migration route with the current system.

Project area: Based on the habitat utilization of this species, adult blue sharks may venture into nearshore waters of the Long Island Sound, but are not likely to occupy the Project area.

Sandbar Shark: Larvae and Adults

Primary source: Compagno (1984), USDOC (1999b)

The sandbar shark is an abundant, coastal-pelagic shark of temperate and tropical waters that occurs inshore and offshore. It is found on continental and insular shelves and is common at bay mouths, in harbors, inside shallow muddy or sandy bays, and at river mouths, but tends to avoid sandy beaches and the surf zone. Sandbar sharks migrate north and south along the Atlantic coast, reaching as far north as Massachusetts in the summer. Sandbar sharks bear live young in shallow Atlantic coastal waters between Great Bay, New Jersey, and Cape Canaveral, Florida. The young inhabit shallow coastal nursery grounds during the summer and move offshore into deeper, warmer water in winter. Late juveniles and adults occupy coastal waters as far north as SNE and Long Island.

Project area: Sandbar sharks are a migratory, coastal-pelagic species. The Project area is an unlikely nursery ground for this species, but late juvenile and adult sandbar sharks probably occupy the Project area during the summer.

Sand Tiger Shark: Larvae

Primary source: NMFS (2000)

Sand tiger sharks are coastal, littoral sharks with a broad inshore distribution, usually found from the surf zone down to depths of 23 m. Sand tiger sharks are also found in shallow bays, around coral reefs and to depths of 183 m on the continental shelf. In the western Atlantic, this shark occurs from the Gulf of Maine to Florida. Sand tiger sharks have been observed hovering above the seabed in or near deep sandy-bottom gutters or rocky caves, usually in the vicinity of inshore rocky reefs and islands.

Project area: Based on the habitat utilization of this species, sand tiger shark larvae are likely to occupy the Project area.

4.1.4 Marine Benthic Communities

Many of the EFH-designated species are primary bottom feeders or feed on both benthic and pelagic organisms, and therefore have extensive interaction with marine benthic communities (MBC). The Long Island Sound contains a spatially heterogeneous mix of sea-floor environments which provide habitat for a diverse set of soft-sediment assemblages. Ocean Surveys, Inc. (2001) conducted an integrated geophysical survey in the Long Island Sound, between Branford, Connecticut and Wading River, New York, and categorized the bottom sedimentary environments along the proposed pipeline route as predominantly (98%) fine-grained deposition.

The fine-grained deposition environment is blanketed by muddy sands and/or mud, accumulating under weak bottom current conditions. This substrate comprises 50% of the Long Island Sound basin and occupies large areas of the central and western Long Island Sound. Typical MBC organisms along the proposed pipeline route associated with fine-grained deposition environments are Polychaeta (*Nephtys incisa* and *Cistenoides gouldii*) and Bivalvia (*Mulinia lateralis*, *Nucula annulata*, and *Pitar morrhuana*).

During the survey, several rocky subtidal habitats were found within about 2.5 miles of the Connecticut shoreline in the vicinity of the Thimble Islands. A variety of red and brown algae, and to a lesser extent green algae, are common in the rocky subtidal habitat of the Thimble Islands. The rocky, hard surface provides an attachment site for the algae species, as well as sponges, hydroids, bryozoans, mussels, oysters, and tunicates. It also provides a primary food habitat and shelter for foraging fish, crabs, urchins, snails, and other invertebrates.

Another MBC of importance are seagrass beds. The common seagrass in New England is eelgrass (*Zostera marina*), which occurs in shallow subtidal waters of coastal and estuarine areas. Eelgrass is typically found in soft sediment areas from the mean low water mark to a depth of 3.5 m. Similar to the rocky habitat, eelgrass provides refuge and forage opportunities for a variety of fish and invertebrate species.

5.0 ASSESSMENT OF IMPACTS AND MITIGATIVE MEASURES

In this section, potential impacts to managed species and EFH are examined. Identifiable impacts generated by the proposed action for the estuarine and marine components of the EFH are described below. Potential environmental consequences that may result from impacts to EFH are reviewed, as well as the mitigative measures that would be taken by Islander East to prevent or minimize impacts to EFH, when applicable.

The information is presented in the following order:

- Identification of Impacts to EFH components;
- Environmental Consequences of the Proposed Action; and
- Summary of Proposed Mitigative Measures and Guidelines for EFH Protection.

5.1 IMPACTS TO EFH

The proposed pipeline project would traverse approximately 22.6 miles of the Long Island Sound, including 11.0 miles of Connecticut state waters and 11.6 miles of New York state waters. EFH impacts of concern include disturbance to benthic prey species along the proposed pipeline route, effects of sedimentation and turbidity plumes from construction activities, and disturbance to rocky intertidal habitats and nearshore shellfish lease beds near the Connecticut shoreline. Pipeline burial and operation could hinder migration of American lobster (*Homarus americanus*) and flounder. Additional impacts to fish and shellfish species from activities associated with construction of the proposed Islander East Pipeline Project may result from temporary degradation of water quality due to trenching, pipeline installation, pipeline burial, the release of drilling fluids from HDD operations, and fuel spills, as described below.

Direct and Indirect Impacts to the Estuarine and Marine Component of the EFH

The Long Island Sound has water quality characteristics at certain times of the year and in certain portions that fluctuate more extremely between estuarine conditions and marine conditions. As a generally enclosed coastal body of water, it shares some characteristics typical of other southern New England estuaries with salinity varying tremendously from strictly marine levels around 34 ppt to nearly freshwater in harbors with large coastal rivers during spring snowmelt. The Long Island Sound has two openings instead of one with more through-flow of water induced by tidal forces and wind, and therefore the majority of the water volume in the Long Island Sound remains near marine salinity conditions or slightly lower.

The estuarine system consists of deepwater tidal habitats and adjacent tidal wetlands that are usually semienclosed by land but have open, partly obstructed, or sporadic access to the open ocean, and in which ocean water is at least occasionally diluted by freshwater runoff from the land

(Cowardin *et al.* 1979). The marine system consists of the open ocean overlying the continental shelf and its associated high-energy coastline. Marine habitats are exposed to the waves and currents of the open ocean and the water regimes are determined primarily by the ebb and flow of oceanic tides with salinities exceeding 30 ppt and little or no dilution except outside the mouths of estuaries (Cowardin *et al.* 1979). Although the majority of the water volume in the Long Island Sound remains near marine condition or slightly lower, the entire Long Island Sound is considered a complex and symbiotic estuary that is home to numerous marine fish, shellfish, and macroinvertebrate species. Due to the consistency in the construction techniques for the pipeline project, impacts to the estuarine and marine component of the Long Island Sound on EFH would be similar.

Many EFH-designated larval and juvenile species depend on Long Island Sound for food and shelter for growth into maturity. Most demersal and motile finfish, shellfish, and macroinvertebrate species would avoid the construction areas and escape without injury. However, larvae and small YOY juveniles that live in contact with the bottom and are poor swimmers, and sessile benthic macroinvertebrates that live in the sand, would be most at risk from the construction process (*i.e.*, jetting sled, subsea plow, dredging, and barge anchors). YOY juveniles of summer flounder and windowpane are EFH-designated species most at risk. Juvenile flounders are likely to be present on the bottom of the Project area throughout most of the year and would be most vulnerable in the spring and summer, just after they settle to the bottom and are still very small.

The jetting sled, subsea plow, and dredging would cause indirect impact by the removal of benthic infaunal prey organisms, and some epifaunal prey organisms, for bottom-feeding EFH-designated species. Any benthic organism that lives in the sand (infauna) and the smaller, less motile organisms that live on the bottom (epifauna) and are not capable of avoiding the sled, plow, and dredge, would be dislodged from bottom substrates and likely suffer injury or mortality. Most of these organisms would be invertebrates, but a few small forage fish such as sand lance (*Ammodytes americanus*), which burrow into the sand, also would be affected.

The temporary loss of benthic prey resources caused by construction of the Islander East Pipeline Project would not have any serious adverse effects on EFH for any species that feeds primarily on more motile epifaunal organisms (*e.g.*, crabs, mysids, sand shrimp) or fish, because these organisms would re-colonize the Project area almost immediately after the sand is removed. For this reason, most of the EFH species and non EFH-designated but commercially and/or recreationally important species in the Project area would likely continue to feed along the pipeline route even after the sled, plow, and dredge passed through. The negative effects of prey removal are temporary, lasting only as long as it takes for benthic invertebrates to re-colonize the bottom. Benthic communities usually re-establish within one annual recruitment period (*i.e.*, within 8 to 9 months) (USACE 2001).

Pipeline construction may have short-term benefits to some EFH-designated species. Brinkhuis (1980) conducted a literature assessment on the biological effects of sand and gravel mining in the Lower Bay of New York Harbor, and found that during and immediately after dredging, fish are attracted to the area to feed on infaunal organisms that are dislodged from the bottom. Due to the composition of the benthic infaunal organisms, the bottom feeding fish species (flounders) would be the primary species attracted to feed along the pipeline route following sled, plow, and dredging activities. However, opportunistic species (striped bass) would also seek the Project area as a prime source of food. Species attracted to the project activity would be limited to highly motile species (mostly in the juvenile and adult stage) that can avoid direct impact from the sled, plow, and dredge.

Sedimentation and Turbidity

The construction process would cause an increase in sedimentation and turbidity in the Project and adjacent areas. Increased sedimentation has the potential to decrease predation ability of sight feeders (flounders), cause gill damage and lead to suffocation of fish species, and smother demersal eggs and larvae. Sedimentation and turbidity loads during pipeline construction would be temporary as the suspended sediments would redeposit upon completion of construction. Any bottom-feeding finfish that had trouble finding sufficient prey along the construction route would simply relocate to the adjacent unaffected areas to feed. Pipeline construction may result in the loss of prey species and mortality to eggs and larvae along the proposed pipeline route. However, the overall potential impacts to EFH-designated species would be temporary and minor as displaced fish would rapidly return to the affected areas after construction, and spawning activities that occur over broad areas of the Long Island Sound would be unaffected.

Shellfish larvae are particularly sensitive to increased levels of suspended materials in the water column. However, impacts would be minimized by scheduling construction activities to avoid the spawning season. In addition, Islander East would use the HDD construction method for the nearshore coastal waters of Connecticut to avoid direct impacts to rocky subtidal habitats and shellfish lease beds. Impacts from the displacement or mortality of infaunal shellfish populations of the Long Island Sound would be minimal due to the extensive range of these organisms and the extensive availability of undisturbed nearby habitats for post-construction recruitment.

The primary direct impacts would be destruction of benthic species within the zone of actual disturbance; impairment of benthic habitats due to pipe lay down, pipeline lowering, or barge anchor placement; and increased possibility of exposure to petroleum fuels in the event of an accident or fuel spill. Use of the subsea plow and dredging construction method would cast spoil materials approximately 40 ft on either side of the trench. Most of the infaunal organisms within this 80-foot corridor would be killed. Regardless of the actual quantification of area affected, relative to the area of the Long Island Sound that is crossed, the impacts would be temporary, local, and insignificant. Many infaunal marine invertebrates have several generations per year, and most others have a life cycle every one or two years. Similar to the shellfish species, recruitment of young for most species would be rapid from adjacent unaffected areas.

Direct and Indirect Impacts of Pipelay and Pipeline Construction

Other impacts to the MBC include the potential for blasting and construction through rocky subtidal habitats. The majority (98%) of bottom habitat crossed consists of soft bottom substrate composed of unconsolidated sediments with no blasting requirements (Ocean Surveys, Inc. 2001). However, rocky subtidal habitats are located near the Connecticut shoreline between approximately MPs 10.2 to 10.9. Islander East would avoid these areas by use of the HDD construction method.

Blasting and construction through unidentified rocky subtidal habitat may be necessary should Islander East encounter unanticipated bedrock where the pipeline would be installed by seaplow or jetting between MPs 10.9 to 32.8. Should blasting be necessary in these areas, the degree of acoustic shock impacts on fish, shellfish, and macroinvertebrates would depend on the type of explosive, blasting technique, and timing. Blasting would be performed by licensed professionals who would acquire all necessary permits and comply with legal requirements in connection with the transportation, storage, and use of explosives, and blast vibration limits for nearby utilities. To dampen the shock wave during blasting, time delayed detonations would be used as well as stemming (small rocks) placed on top of each charge to alleviate acoustic shock impacts. After blasting, the blasted trench would be excavated using a dredge barge.

Blasting would result in destruction of physical habitat or structure. Motile benthic fauna would be disturbed and relocate during pre-blasting activities (*i.e.*, divers inspecting the blast area and the drilling of holes for the explosives). Sessile benthic fauna at the blasting and adjacent sites would suffer mortality from the explosion or acoustic shock. However, backfilling of the blasted areas would create new physical habitat or structure and recolonization would follow immediately upon completion of construction.

Shellfish lease beds could be direcly impacted by trenching and pipelay activities. No shellfish species indigenous to the Long Island Sound are classified/designated as EFH in the Project area. However, shellfish represent a potential food source for five EFH species, including winter and summer flounder, scup, American plaice, and sandbar shark. Islander East has committed to using the HDD construction method that would avoid direct impacts to the majority of shellfish lease beds. However, one shellfish lease area (lease L-555 at MP 12.6) would be directly disturbed by trench excavation for 2,216 linear feet (approximately 4.07 acres). Islander East states it would continue to work closely with the lease holder to coordinate construction plans and timing of construction to minimize impacts to the use of this area. In addition, Islander East is currently conducting the site-specific *Long Island Sound Sampling, Analysis, and Study Plan* to gather data on construction related direct and indirect impacts to living habitat and water quality along the proposed pipeline route in the Long Island Sound.

Anchor Scars, Cable Sweeps, Trenching and Pipelay

An additional source of impact to benthic fauna is the placement of anchors for the pipe lay and bury barges. There are two components of the impact: the actual anchor scar from the footprint impact of an anchor during each placement, and the scraping or sweeping of the sea bottom from the movement of the anchor cables across the sea bottom (cable sweep), as the forward anchor arrays are winched in and the aft anchor arrays are played out.

Anchor scars for the size barges that would be used on this project are predicted to be up to 8 feet deep and affect about 172 square feet (8.6 feet by 20 feet) each. Using an average 10-anchor array and resetting the anchors three times per mile, offshore pipeline construction and burial operations would create an average of 30 anchor scars per mile. Allowing for a total of four passes (one by a pipe lay barge, two by plow or jet, and one by a bury barge), offshore pipeline installation activities would result in 2,628 anchor scars along the 21.9-mile portion of the Long Island Sound crossing, or approximately 10 acres of soft (non-live) sea floor impact. Due to the weight of the anchor and the depth of the scar, the impact on benthic fauna would be complete mortality within the footprint of the scar. A long-term recovery is expected for the impacted footprint of the anchored areas. However, similar to plows and dredging, re-colonization and recruitment of benthic fauna would take place immediately following completion of construction.

Based on area affected, the largest single source of impact to the sea bottom community would be from cable sweep. The area to be affected by cable sweep is expected to be relatively extensive (up to 2,500 feet to the front and back and up to 2,000 feet to either side of the barge). To minimize this impact, Islander East proposes to conduct pipe laying, trenching (by plowing or jetting), and burial using mid-line buoys on anchor lines. These mid-line buoys would keep the anchor cables from making contact with the sea bottom for all but a small portion of the distance from the barge to the anchor. According to Islander East, cable sweep impact to soft bottom in Long Island Sound would be reduced by 50 percent (3,058 acres) from an estimated 5,329 acres down to an estimated 2,271 acres. It is expected for the area of cable sweep that some areas of benthic fauna would survive relatively intact (*e.g.*, areas of benthic fauna within depressions and areas where the cable does not make complete contact). A short-term impact is expected from the cable sweep with re-colonization to follow upon completion of construction.

Direct and Indirect Impacts from Pipeline Burial

In accordance with USDOT safety requirements, Islander East would concrete coat and bury the pipe to at least one-half its diameter in waters > 12 feet deep from MPs 10.9 to 32.8. In addition, Islander East would lay the pipeline on the surface of the seafloor and armor it with stone rip-rap or concrete mats where the pipeline crosses foreign utilities (at MP 25.9 and 26.9) or submerged bedrock outcrops (if discovered). Due to the presence of partially buried pipe, no MBC is expected to recolonize the seafloor area directly below the pipe, but sessile opportunistic species (*e.g.*, barnacles) would be expected to colonize on the surface of the partially buried pipe.

In areas where the pipeline is not completely buried, the NMFS and local interest groups have expressed concern regarding potential impacts to American lobster and flounder migration. The concrete coated pipeline would be partially buried to at least one-half its diameter from MPs 10.9 to 32.8. Although this portion of the partially buried pipeline would permanently protrude above the seafloor, it would create a potential maximum barrier only approximately 20-inches tall by 38-inches wide on the seafloor.

Changes in water temperature stimulate lobster migration from warmer shoal waters to deeper waters during the winter season (McKenzie and Moring 1985). Lobster in the Long Island Sound have been known to migrate over 120 miles from the Long Island Sound to Veatch Canyon (The Lobster Conservancy 2002). Although lobsters are benthic crustaceans not known for their swimming capabilities, they posses a strong, powerful tail which they use to propel themselves through the water column to escape from predators. Herrnkind (1970) found that migrating lobsters maintain a bearing while moving over substrate of variable slope and at varying depths, in water visibility less than six feet, under completely overcast skies, and in areas of complex currents. As a result of its routine, long-distance migration over variable slopes and strong swimming ability, the Amercian lobster would be capable of easily swimming over a 20-inch-tall, 38-inch-wide, parially buried pipeline. Therefore, the partially buried pipeline would not represent a significant obstacle to lobster migration.

Similar to the American lobster, changes in water temperature stimulate flounder migrations. Winter flounder (Pereira *et al.* 1999), summer flounder (Packer *et al.* 1999), and windowpane (Chang *et al.* 1999) are benthic species and strong swimmers with the capability of migrating from the outer continental shelf to inshore waters for food and to spawn. Based on recent studies conducted of winter flounder migration, tagged flounder have been confirmed to migrate a distance of over 200 miles to spawn in SNE and New York waters (Pereira *et al.* 1999). Winter flounder are capable of swimming 25 miles in one season in the New York Bight, which is comparable to Saila's dispersion coefficient of over 1.7 square miles per day, indicating non-directional movement (Phelan 1992). As a result of their routine, long-distance migration and strong swimming ability, flounders would be capable of easily swimming over a 20-inch-tall, 38-inch-wide, partially buried pipeline. Therefore, the partially buried pipeline would not represent a significant obstacle to flounder migration.

Potential for Offshore Oil Spills

Another potential impact to marine and estuarine fish and wildlife is accidental spills of petroleum lubricants and fuel during pipeline construction. These spills could originate from accidental spills from construction barges or support boats, loss of fuel during fuel transfers, or accidents resulting from collisions. Construction would involve a significant amount of work activity aboard vessels, and the movement of pipeline lay barges, supporting vessels, and other specialized marine equipment. Islander East and their construction contractor must comply with all laws and regulations related to the handling of fuels and lubricants, including 40 CFR Part 110, and vessel-to-vessel transfers, including 33 CFR Part 155. Additionally, Islander East would implement the containment and clean up measures outlined in its Spill Prevention Containment and Countermeasures (SPCC) Plan in the event of any spill or release. Implementation of these measures would avoid or minimize potential impacts of accidental oil and fuel spills on estuarine and marine EFH.

5.2 ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION

Coastal and Marine Environmental Degradation

The degradation of coastal and marine EFH habitats is associated with the following:

- temporary disturbance and displacement of fish species;
- increased sediment loads and turbidity in the water column;
- temporary loss of food items to fisheries;
- limited disruption or destruction of subtidal rocky habitats;
- limited sediment transport and re-deposition; and
- temporary degradation of the water quality due to construction activities (*e.g.*, trenching burial, pipe laying, spills, discharge of HDD drilling muds).

Most of the above effects are temporary, and would be offset by special construction techniques or environmental protection guidelines, or are negligible considering the localized effect of the actions compared to the area of the Long Island Sound that would be unaffected. In this sense, the coastal and marine environmental degradation from the Islander East Pipeline Project would have minor effects on EFH-designated species and benthic fauna. Direct loss to fish and benthic populations would be short-term and negligible. Recovery of EFH-designated species and benthic fauna is expected to occur quickly (one growing season) for the majority of the affected environment.

The EFH impact evaluation process for the Islander East Pipeline Project is summarized below in Table 5-1. Impacts are listed by type and nature (*i.e.*, significance of effects). Impacts are considered direct, indirect, temporary, short-term, long-term, permanent, and/or cumulative.

5.3 PROPOSED MITIGATIVE MEASURES AND GUIDELINES FOR EFH PROTECTION

There are no Federal- or state-specific EFH guidelines or standards for construction of the Islander East Pipeline Project. However, Islander East has developed a SPCC Plan to avoid or minimize the effects of accidental fuel and other chemical spills on aquatic resources. Due to the proximity of lease shellfish beds to the pipeline corridor, Islander East would continue to work extensively with state agencies and local shellfishermen to minimize impacts on shellfish resources occurring along the pipeline corridor until completion of the proposed Project. In addition, Islander East would use the HDD construction method to avoid and minimize impacts to rocky subtidal habitats and lease shellfish beds. Islander East would prepare a Directional Drill Contingency Plan (Drill Plan) describing how inadvertent releases of drilling mud would be handled during the HDD crossing. In support of Drill Plan preparation, Islander East is evaluating the feasibility of various drill mud containment measures for the Long Island Sound exit point. Islander East would also continue to work with NMFS biologists in evaluating burial options of deep water construction to further minimize potential impacts on lobster and fish migration.

TABLE 5-1
Summary of Potential Impacts to EFH by Impact Type

Type of Impact	Temporary (Recovery Days to Weeks)	Short Term (Recovery < 3 Years)	Long Term (Recovery > 3 to < 20 Years)	Permanent (Recovery ≥20 Years)	Cumulative
Post-plow Lowering[a]		√	√		
Barge Anchoring[a]			√		
Pipelay on Seafloor (completely buried)[a]		√			
Pipelay on Seafloor[a] (partially buried)			√	√	
Sedimentation/Turbidity[b]	√				
Disruption of Hard Substrate[a]			√	√	√
Disruption of Live Bottom/Soft Substrate[a]		√	√		
Seafloor Area Occupied[a]				√	√
Epifauna/Infauna Destruction[a]		√	√		
Fish Fauna Disruption Species[b]	√				
Fish Fauna Disruption Habitat[b]		√			
Reduction of Water Quality/Spills, Mud discharges[a]		√			

[a] Direct Impacts [b] Indirect Impacts

5.4 PERMITS AND APPROVALS

Table 5-2 lists the anticipated environmental permits and approvals that would be needed or for which Islander East intends to apply. Documentation of agency approvals and permits would be provided to the Federal Energy Regulatory Commission (FERC) prior to construction.

TABLE 5-2
Agency Permits and Approvals

FEDERAL

Advisory Council on Historic Preservation
- Review under Section 106 of the National Historic Preservation Act

Department of the Army, Corps of Engineers
- Permit under Section 10 of the Rivers and Harbors Act
- Permit under Section 404 of the Clean Water Act

Department of Commerce, Coast Guard
- Review of Section 10 of the Rivers and Harbors Act

Department of Commerce, National Marine Fisheries Service
- Review under Section 7 of the Endangered Species Act
- Review under the Marine Mammals Protection Act
- Review under the Magnuson-Stevens Fishery Conservation and Management Act

Department of the Interior, Fish and Wildlife Service
- Review under Section 7 of the Endangered Species Act

Federal Energy Regulatory Commission
- Certificate of Public Convenience and Necessity under Section 7 of the Natural Gas Act

Environmental Protection Agency
- Water Quality Certification under Section 401 of the Clean Water Act
- Permits under Section 402 of the Clean Water Act
- Review of Section 404 application

STATE - CONNECTICUT

Department of Environmental Protection
- Review of State Protected Species
- Permit of Construct and Operate an Air Emission Source
- Review and Approval of Noise Analysis
- Permit for Stormwater and Dewatering Discharges
- Permit for Hydrostatic Test Water Discharges
- Coastal Zone Consistency Determination
- Permit for Inland Wetland and Watercourse Crossings
- Permit for Stream Channel Encroachment
- Permit for Structures, Dredging and Fill
- Permit for Water Diversion
- Permit for Water Quality Certificate under Section 401 of the Water Quality Act

Siting Council
- Certificate of Environmental Compatibility and Public Need
- Development and Management Plan Approval

TABLE 5-2
Agency Permits and Approvals

STATE - NEW YORK

Department of Environmental Conservation
- Review of State Protected Species
- Permit for Freshwater Wetland Crossings [Article 24, Environmental Conservation Law (ECL)]
- Permit for Tidal Wetland Crossings (Article 25, ECL)
- Permit for Protected Water Crossings under Wild, Scenic, and Recreational River Systems (Article 15, Title 27, ECL)
- Permit under the State Pollutant Discharge Elimination System
- Permit for Water Quality Certificate under Section 401 of the Water Quality Act
- Permit for Coastal Erosion Hazard Areas (Article 34, ECL)

Department of State
- Certification of Consistency under the Coastal Zone Management Act

Office of General Services
- Permit to Cross Land Beneath Coastal Waters and Waters of Large Lakes and Rivers

6.1 UNAVOIDABLE IMPACTS

Some unavoidable impacts would be generated during the development of the Islander East Pipeline Project considering the geographic coverage of the area of influence of the Project and the diversity of habitats traversed through Long Island Sound. However, significant effort was made to prevent or minimize impacts to particularly sensitive habitats. The pipeline route design purposely avoided long-term impacts to seagrass beds, rocky subtidal habitats, and shellfish lease beds. Islander East also proposed the use of specialized construction techniques to prevent damage to sensitive resources, when crossing these features was inevitable. Islander East would use the HDD construction method to traverse and minimize impacts to seagrass beds, rocky subtidal habitats, and shellfish lease beds.

The remainder of the marine segment of pipeline would affect soft bottom habitat across 21.9 miles of Long Island Sound. Thus the selected route is biased towards crossing soft bottom (or sand bottom) habitat, which is more resilient to temporary disturbance and has the ability to recover to pre-construction conditions faster than that of live bottom habitat. Impact to habitats in water < 12 feet deep are judged to be short term because recovery can occur in a time frame of months to two years, whereas impacts to habitats in waters > 12 feet deep would be long term with a recovery rate between 3 to 20 years, or more.

Some impacts to EFH are recognized as permanent (*i.e.*, blasting and trenching through unanticipated rock outcropping and rocky subtidal habitat), because full recovery can take up to 20 years. The other example of a permanent impact is the change of bottom type from natural sediment to the artificial substrate of the pipeline itself in areas > 12 feet where the pipeline would be buried up to one-half its diameter.

In contrast to some long term and permanent impacts to EFH, the direct impact on the EFH managed species would be largely temporary. This is because the primary impact directly to the fish species is the temporary impairment of water quality due to high turbidity and suspended solids concentrations during jetting sled, subsea plow, and dredging. Most adult fish are motile and would actively avoid direct impact from the pipe laying and trenching activities. Some impairment of ability of EFH-designated species to find prey items could occur, but this effect would be temporary and spatially limited to the immediate vicinity of pipeline construction activities.

EFH-designated prey species (benthic fauna) would also be directly impacted. The sled, plow, and dredging of the trench would cause direct disturbance of benthic fauna. Although mortalities to benthic fauna are expected, the recruitment rate for re-colonization of the disturbed area would be high from adjacent unaffected areas. Impacts to benthic fauna would occur during the one-time pipeline installation event and be short-term. Complete recovery is expected within 8 to 9 months for shallow water benthic areas (< 12 ft deep). However, due to the presence of the partially buried pipe in waters >12 feet deep, no recovery is expected for the seafloor area directly below the pipe.

Sessile opportunistic species (*e.g.*, barnacles) are expected to colonize on the surface of the partially buried pipe.

6.2 MITIGATIVE MEASURES

This section summarizes actions already taken by Islander East to minimize impacts, the future actions to which Islander East is committed, and the recommended mitigative measures proposed by the FERC to minimize impacts to EFH.

Islander East has already taken, or is in the process of taking, the following measures to minimize impacts to EFH:

- Perform extensive field investigations (*Long Island Sound Sampling, Analysis, and Study Plan* for the Proposed Islander East Pipeline);
- Avoid direct impacts to seagrass beds, subtidal rocky habitats, and shellfish lease beds;
- Develop the offshore SPCC Plan for prevention and cleanup of accidental fuel and chemical spills; and
- Develop the Drill Plan to prevent impacts associated with the HDD construction method.

Islander East is committed to using the following construction practices to minimize impacts to EFH:

- Use the HDD construction method to avoid direct impacts to rocky subtidal habitats and shellfish lease beds; and
- Use mid-line buoys on anchor lines to reduce anchor scar and cable sweep effect.

The FERC has developed the following recommendation to further reduce the impacts to EFH:

- Use the subsea plow construction method for pipeline installation near the shellfish lease beds and through any sensitive areas of the Long Island Sound designated by state and Federal agencies;

6.3 AGENCY VIEW OF THE PROJECT

The following are the FERC's views of the affect of the Islander East Pipeline Project on EFH.

6.3.1 Subtidal Rocky Habitats

The NMFS and Connecticut Department of Environmental Protection (CTDEP) are concerned with the potential of the Project to impact subtidal rocky habitats. Islander East has committed to use the HDD construction method that would avoid direct impacts to subtidal rocky habitats along the Connecticut shoreline from approximately MPs 10.1 to 10.9. Blasting and construction through rocky subtidal habitats may be necessary should Islander East encounter unanticipated bedrock from MPs 10.9 to 32.8. If blasting is required, Islander East would implement delayed detonation and place stemming on top of each charge to alleviate acoustic shock impacts. Blasting would be performed by licensed professionals who would acquire all necessary permits and comply with legal requirements in connection with the transportation, storage, and use of explosives, and blast vibration limits for nearby utilities.

6.3.2 Seagrass Beds

The NMFS and CTDEP are concerned with the potential of the Project to impact seagrass beds. Seagrass beds are limited by suitable substrate, water quality conditions, and water depth. Islander East has made route adjustments to avoid direct impacts to identified seagrass beds at the Thimble Islands, and has committed to using the HDD construction method that would avoid direct impacts to any potential seagrass beds along the proposed route near the Connecticut shore. In addition, Islander East is currently conducting the site-specific *Long Island Sound Sampling, Analysis, and Study Plan* to gather data on construction related direct and indirect impacts to living habitat and water quality along the proposed pipeline route in the Long Island Sound.

6.3.3 Shellfish Lease Beds

The NMFS, CTDEP, and local interest groups are concerned with the potential of the Project to impact shellfish lease beds. No shellfish species indigenous to the Long Island Sound are classified/designated as EFH in the Project area. However, shellfish represent a potential food source for five EFH species, including winter and summer flounder, scup, American plaice, and sandbar shark. Islander East has committed to using the HDD construction method that would avoid direct impacts to the majority of shellfish lease beds. However, one shellfish lease area (lease L-555 at MP 12.6) would be directly disturbed by trench excavation for 2,216 linear feet (approximately 4.07 acres). Islander East states it would continue to work closely with the lease holder to coordinate construction plans and timing of construction to minimize impacts to the use of this area. In addition, Islander East is currently conducting the site-specific *Long Island Sound Sampling, Analysis, and Study Plan* to gather data on construction related direct and indirect impacts to living habitat and water quality along the proposed pipeline route in the Long Island Sound.

6.3.4 Lobster and Flounder Migration

The NMFS and local interest groups are concerned with the potential of the exposed section of the pipeline to hinder American lobster and flounder (*i.e.*, winter flounder, summer flounder, and windowpane) migration. The concrete coated pipeline would be partially buried to at least one-half its diameter from MPs 10.9 to 32.0. Although this portion of the partially buried pipeline would permanently protrude above the seafloor, it would create a potential maximum barrier only approximately 20-inches tall by 38-inches wide on the seafloor.

Changes in water temperature stimulate lobster migration from warmer shoal waters to deeper waters during the winter season (McKenzie and Moring 1985). Lobster in the Long Island Sound have been known to migrate over 120 miles from the Long Island Sound to Veatch Canyon (The Lobster Conservancy 2002). Although lobsters are benthic crustaceans not known for their swimming capabilities, they posses a strong, powerful tail which they propel through the water column to escape from predators. Herrnkind (1970) found that migrating lobsters maintain a bearing while moving over substrate of variable slope and at varying depths, in water visibility less than six feet, under completely overcast skies, and in areas of complex currents. Similar to the American lobster, changes in water temperature stimulate flounder migration. Winter flounder (Pereira *et al.* 1999), summer flounder (Packer *et al.* 1999), and windowpane (Chang *et al.* 1999) are benthic species and strong swimmers with the capability of migrating from the outer continental shelf to inshore waters for food and to spawn. Based on recent studies conducted of winter flounder migration, tagged flounder have been confirmed to migrate a distance of over 200 miles to spawn in SNE and New York waters (Pereira *et al.* 1999). Winter flounder are capable of swimming 25 miles in one season in the New York Bight, which is comparable to Saila's dispersion coefficient of over 1.7 square miles per day, indicating non-directional movement (Phelan 1992). As a result of their routine migration habits and strong swimming abilities, American lobster, summer flounder, winter flounder, and windowpane would be capable of easily swimming over or around a 20-inch-tall obstacle, such as the partially buried pipeline. If necessary, Islander East also would consult state permitting agencies to evaluate burial options to further minimize potential impacts on lobster and flounder migration.

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APPENDIX J

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APPENDIX K

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